USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Pilot Study of Bio-markers for Evaluation of Water Quality in Iowa Streams

Focus Categories: WQL,SW,MET

Keywords: animal waste, human waste, water quality, tracer methods

Duration: 3/1/1999-2/29/2000

Federal Funds Requested: $21,574

Non-Federal Funds: $44,088

Principal Investigators: George Breuer, P. Subramanian, Stephen J. Reynolds

Congressional District: Iowa, 1st District

Statement of Critical Regional or State Water Problems

Iowa's daily consumption of 3 billion gallons of water is derived both from surface and ground water. Streams contribute 75%, while underground aquifers account for 25% of the water consumed [1]. Ordinarily, thermotolerant fecal-coliforms and nitrate loads are monitored as indicators of water pollution. However, these methods do not provide information for identification of the origin of pollution, and also lack specificity for human wastewater and various sources of agricultural run off [2-8]. In addition, the coliform method possibly underestimates the degree of pollution because the quantitation is based on culturable bacteria and the ability to enumerate [9]. Because of these complexities, in addition to low viability of pathogens and indicator organisms, it is desirable to explore stable chemical markers, using multiple and complementary approaches to identifying the degree and source of contamination. It will be more discerning to identify biologically derived metabolites that are unique to human and various animal species. Biologically derived markers that may be investigated include lipoglycerides, lipopolysaccharides, antioxidants, caffeine and cholesterols. A wide spectrum of tracers for fingerprinting is available within this pool of persistent chemicals and their metabolites. The specific research goals of this initial pilot study are therefore to identify sterol based biomarkers useful in achieving definitive monitoring and evaluation of Iowa streams, especially those passing through rural agricultural areas and a Pennsylvania stream in natural wildlife ecosystem, and urban populations. This will facilitate selective tracing of the most relevant sterol-biomarkers for monitoring streams that serve as sources of raw water. The data will provide a basis for comparative evaluation of the current microbiological methods and particle counts with the efficiency of biomarker method(s).

Statement of Results or Benefits

This initial pilot study will identify sterol based biomarkers useful in achieving definitive monitoring and evaluation of Iowa streams, especially those passing through rural agricultural areas, a Pennsylvania stream in natural wildlife ecosystem, and urban areas. This will facilitate selective tracing of the most relevant sterol-biomarkers for monitoring streams that serve as sources of raw water. The data will provide a basis for comparative evaluation of the current microbiological methods and particle counts with the efficiency of biomarker method(s), and provide data for the evaluation of such biomarker methods as indicators of surface water and groundwater quality.